



# 6 technology

*The rapid computerization  
and networking of American  
businesses, industries, and  
homes has been called a  
“microprocessor revolution.”*

*That revolution is fundamentally  
transforming the way—and the speed  
with which—people think, connect, collabo-  
rate, design and build, locate resources, manipulate  
tools, conduct research, analyze and forecast, reach markets,  
present themselves and their wares, move and track products,  
make transactions—in short, do business.*

## TECHNOLOGY IS TRANSFORMING THE U.S. ECONOMY

Advances in the computer industry, coupled with those in telecommunications, have created the new information technology, or IT, industry and inaugurated an information age. By 2006, nearly half of all U.S. workers will be employed in industries that produce or intensively use information technology, products, and services, according to U.S. Department of Commerce projections.<sup>1</sup>

The workplace and workforce impacts of these technological changes have been so pervasive, so dramatic in size and speed, as to be hard to describe. A brief look backward, however, is illustrative.

Starting in the 1950s, an entirely new industry was established, led by the large “mainframe” computer companies such as IBM, RCA, Honeywell, and Univac. These companies opened a host of new jobs producing, maintaining, and servicing computer systems. Computer programmers, keypunch operators, computer service technicians, and computer sales personnel were soon in demand by the tens of thousands—good jobs to support a growing industry.

Yet in less than fifty years, only a relative handful of the jobs created in that initial wave of computerization still exist, held by workers servicing older systems still in operation. In their wake have come millions of still-newer jobs in an ever-widening variety of computer applications created to capitalize on the capacities of hardware and software systems. The life span of a personal computer provides one illustration of the diminishing time between introduction and “obsolescence” of new technologies. The average life of a personal computer, or PC, has decreased from 4½ years in 1992 to just over 3 years in 1999, and is predicted to be only 2 years by 2007.<sup>2</sup>

## THE INFORMATION TECHNOLOGY INDUSTRY IS EVOLVING RAPIDLY

To understand the dynamics of the transformation underway, it is important to grasp both the scope and the speed of this revolution. Its roots are indeed very recent, beginning with the widespread introduction of large mainframe computers in the 1950s and '60s, followed by steady advances in

# and globalization

computing power that permitted a decrease in their physical size. The introduction and dramatic growth of personal computers in the 1980s took even the computer industry by surprise, threatening the mainframe operations of the larger companies. Computers moved into millions of American homes.

Connecting personal computers so that people throughout an organization could communicate expanded the possibilities for these tools. Once such local area networks, or LANs, were established, it was a relatively short step to linking an individual computer or a whole network with remote users over telephone lines, using a modem to transmit the signal. Access by personal computer to information in remote mainframes, bulletin boards, and other networks significantly enhanced the utility and power of these networks.

When computers needed to “talk” to one another, incompatibilities among computer systems became a problem, which in turn was addressed by efforts to standardize file formats, creating a common language. This language—HTML, for hypertext markup language—became the core of the Internet. Widespread acceptance of the Internet brought together the power of computing with a standardized protocol, enabling millions of computers to communicate with one another. An estimated 64 million Americans go on line every month.<sup>3</sup> The Internet generated an estimated \$300 billion in revenues in 1998, approaching the size of the automobile industry.<sup>4</sup>

B O X 6.1

## Computer power

Moore’s Law (named for the founder of Intel Corporation) holds that the processing power of microchips doubles every 18 months. The costs of computing are falling sharply, dropping by nearly 25 percent per year,<sup>5</sup> underpinning the growing importance of technology in the workplace, the development of the Internet, and the reduction in communication costs that is a factor in the globalization of the economy.

The market for under-\$1,000 personal computers now makes up half of all U.S. computer sales. As a result, half of U.S. homes have PCs.<sup>6</sup> In 1997, the most powerful PCs on *Business Week’s* yearly “best buys” list were priced over \$3,000; in 1998, only one PC on the list was that expensive. A standard PC in 1997 came with 32 megabytes of memory and a 4-gigabyte hard drive; in 1998, a similarly priced model came with twice the memory and a zip drive or a DVD drive as well.

The future of computers may extend to the realm of what was previously only science fiction. Noted computer scientist Ray Kurzweil predicts that by 2019, a \$1,000 computer (in 1999 dollars) will be able to perform 20 million billion calculations per second and will be equivalent in sophistication to the human brain.<sup>7</sup>

Improvements in computer technology signify that computers will be an even stronger presence in the American workplace in the future.

The power of the Internet and the increasing power of computers (*see box 6.1*), which allow for digitizing various forms of communication from voice to video, is driving the information technology and communications industries toward convergence. Television, voice communication, the Internet, and other forms of communication are all

moving towards common frameworks based on digital systems. With these common frameworks, all such forms of information can be transmitted on common distribution systems, processed by common microprocessor technologies, and stored in common digital filing structures.

#### THE TECHNOLOGICAL REVOLUTION SPREADS

The growth and reach of the Internet enables virtually free communication among a large number of people. In 1995, there were only 22 million Internet users in the United States. By 1998, the figure had quadrupled to 88 million. Estimates are for 110 million users in 1999 and 133 million by the year 2000.<sup>8</sup>

It has taken only seven years for the Internet to be adopted by 30 percent of Americans, compared to seventeen years for television and thirty-eight years for the telephone.<sup>9</sup> This dramatic growth is continuing as the information available on the Internet is growing rapidly and its utility to users is increasing. A novelty in the mid-1990s, the Web has become a household word and an indispensable tool of industry.

Internet access has not grown evenly, however. High-income households are twenty times as likely to be connected to the Internet as those at the lowest income level. Black and Hispanic households are about two-fifths as likely to have home Internet access as are white households, and those in rural areas lag behind those in urban areas. But at least some of these differences are diminishing. The difference in access between blacks and



whites, for example, is narrowing for those with incomes at or above \$75,000.<sup>10</sup> In 1999, 40 percent of blacks age 18 or older used the Internet at home or at work, compared to 55 percent of the general population (including blacks).<sup>11</sup>

The computer and IT revolutions have changed virtually every industry in the economy. Numerous examples illustrate the point:

- A manufacturing plant can be operated by a handful of technicians controlling robotic systems.
- State-of-the-art inventory systems can supply needed parts “just in time” for assembly.
- New jobs have been created in airfreight and delivery systems to service such just-in-time inventory operations.
- Handheld mobile phones have become commonplace, and digital phone systems will soon be able to reach anyone in the world via satellite.

Businesses have found ways to reduce the costs of carrying large inventories of intermediate parts and finished goods through computer-managed inventories and just-in-time manufacturing and servicing. Barcode scanners like those at store

checkout counters are among the innovations that have helped businesses meet consumer demand more effectively by more closely monitoring inventories, reducing lead time for delivery of goods, and reducing inventories.

Leading manufacturers have developed computer links to their suppliers and customers. Their suppliers follow progress on the production line via computer hookup and can plan on shipping parts and materials to the right place at the right time, minimizing inventories and downtime. Their customers have computer access to the latest production status and thus know precisely when to expect delivery. A major airplane manufacturer, for example, maintains a parts-distribution Web page that greatly speeds the pace at which planes are serviced. Locating a part used to take five to ten hours, often forcing cancellation of a flight; parts can now be located within minutes. Diesel-engine manufacturers link via computer to the service records of the truck engines they have sold, permitting them to predict more precisely the demand for replacement engines. Global manufacturing companies link their design centers in different countries to create international design teams.

The technological revolution has also launched entirely new industries, such as biotechnology. Literally hundreds of new companies have emerged in areas unheard of a decade ago. Advances in virology, cancer research, and neurology are being made as a direct result of advances in computational and information systems. Researchers can now use genetic mapping systems to locate the genes responsible for a variety of hereditary diseases. Emerging industries such as environmental

technology benefit from applications ranging from remote sensing systems to biological agents that eat harmful chemicals or waste—applications made possible through advances in computer and information technologies.

The growth of information technology has also had its darker side. Fighting computer viruses like the Melissa virus and the Explore.zip worm cost businesses worldwide \$7.6 billion in the first half

BOX 6.2

*“Web”ster’s Dictionary for the twenty-first century includes:*

■ browser	■ Java	■ virtual server
■ e-commerce	■ search engine	■ World Wide Web (WWW)
■ e-mail	■ simple mail transfer protocol (SMTP)	■ Web page
■ hypertext markup language (HTML)	■ stub networks	■ Web servers
■ HTML tags	■ uniform resource locator (URL)	■ Web site
■ Internet		

of 1999.<sup>12</sup> The increasing accessibility of data has also raised privacy concerns. The new technology has made it very easy to collect personal information, such as medical records, and make it available to a large number of users.

**TECHNOLOGY AND JOB CREATION**  
Employment patterns in the computer-manufacturing sector illustrate the complex impact of technological change on the workforce. Computer-manufacturing jobs skyrocketed until 1984 as American producers dominated world production of all kinds of computers. Between the appearance of the first PCs in the mid-1970s and 1983, computer

industry jobs in the United States grew by nearly 80 percent, while total U.S. manufacturing employment grew by only 4 percent.<sup>13</sup> This dramatic growth was interrupted, however, by the entry of foreign computer producers into U.S. markets, which contributed to a 26 percent drop in U.S. computer employment between 1983 and 1994.<sup>14</sup>

future. The dynamics of the change may be less obvious in the future but much more widespread. Pick up any newspaper and read a story about the demand for “high tech” jobs, a demand reflected in the classified ads and their numerous listings for computer specialists, programmers, database administrators, Web designers, and so on. *The*

*Washington Post* classifieds for one day in May 1999, for example, showed job openings for Visual Basic, Java, and CGI programmers, help-desk administrators, e-cable systems designers, GIS analysts, and call-routing specialists—all highly technical jobs, often requiring years of training and experience to qualify.

Yet these jobs often

require much more than the latest high-tech skills. What may not show up in the text of a classified ad is that the content of these high-tech jobs is changing. More employers want computer specialists to be knowledgeable about the industry their business is in, in addition to being technically skilled.

Jobs for database administrators, for example, are among a cluster of related occupations that are projected to increase by 118 percent by 2006. Many employers require their database administrators to have a bachelor's degree in computer science, but for some employers that will not be enough. The database administrator for a publisher of electronic newsletters on health care or engineering may also need to have strong writing and editing skills and special knowledge of those industries.

### Jobs of yesterday . . . and tomorrow

#### ***Yesterday's jobs***

- keypunch operators
- typewriter repair technicians
- mechanical calculating machine repair technicians
- word-processing machine repair technicians
- COBOL and FORTRAN instructors
- mimeograph production technicians

#### ***Tomorrow's jobs***

- Webmasters
- LAN operators
- help-desk operators
- knowledge engineers
- CAD/CAM operators
- desktop publishing operators

That drop in computer-production jobs, however, was more than offset by growth in computer-related jobs for sales clerks, software designers, and LAN operators. This dynamic characterizes the rapidly evolving industry: significant growth in new jobs and activities masks the destruction of older jobs. This “churning” in employment often goes unnoticed. Downsizing, rightsizing, efficiency mergers, and buyouts are facts of life in this industry and throughout the new economy.

With the continued rapid evolution of technology, the cycle of job growth, destruction, and creation will also continue into the foreseeable



Even workers in “nontech” jobs are discovering that the technology revolution has not passed them by. In fact, it is rare to find a job that does not require some knowledge of computers or computer-based systems. On any given day, newspaper classifieds in cities are loaded with help-wanted ads that seem to be designed for workers with little or no experience with technology:

- Administrative help is needed to reorganize an office;
- Experienced auto mechanics are wanted by car dealerships and service stations;
- Receptionists are needed to handle busy phone lines; and
- A travel agency needs an experienced “leisure agent.”

What all of these jobs have in common is the high level of technological skills needed to perform them. Large or small, employers are no longer satisfied with an office worker who is “good with figures” or “detail oriented.” Administrative staff must now be familiar with word-processing suites, accounting and billing software, human resources packages that are computer-based, and 12-to-24-line phone systems that provide call forwarding, voice mail, and conference bridges.

“Old school” auto mechanics can forget about getting a job if they lack the skills to use computer-based diagnostic tools now standard in repair shops. And travel agents who cannot adroitly make travel arrangements using an automated system may soon find themselves relegated to hand-delivering airline tickets. Even doctors and lawyers use technology every day for research, record keeping, or simply to communicate with colleagues and clients.

As the tools of each trade become more sophisticated, many more occupations will have “tech” elements. Most workers will need basic computer skills to enter their chosen occupations and additional specialized training in field-specific applications to advance. It will indeed be a world that rewards lifelong learning.

#### B O X 6.4

#### Veterans lead the way

Every year, almost 200,000 service members leave the military and join over 15 million other veterans in the civilian labor force—all with a host of skills. These veterans stand ready and willing to meet the challenges and demands of working in the twenty-first century’s rapidly changing, global economy.

With the help of the Veterans’ Employment and Training Service, veterans have formed innovative labor–management partnerships to place qualified veterans in high-tech apprenticeship programs or directly into jobs. Combining classroom and on-the-job training, these apprenticeship programs help veterans qualify in many high-tech jobs, including computer programming and systems analysis, computer and telecommunications network installation, and high- and low-voltage utility system repair. These programs can be used as models for other training programs targeting older workers, youths, workers who have lost their jobs because of technological change, and others.

The overall employment picture in high-tech industries is extremely bright. High technology has added over one million jobs to the U.S. economy since 1993.<sup>15</sup> Real average wages in these industries have increased 19 percent from 1990 to 1997, compared with a 5 percent average increase across the private sector. The average high-tech job today pays 78 percent more than the private-sector average.<sup>16</sup>

## TECHNOLOGY IS REVOLUTIONIZING THE WAY WE WORK

Over the century, mass-production occupations have been steadily replaced by office-worker and service-provider occupations. Indeed, virtually all of the jobs that were lost in goods production and distribution since 1969 have been offset by office jobs.<sup>17</sup> Rather than industrial machinery, these

B O X 6.5

### Going to the office is not what it used to be

As technology enables workers to decentralize their work, clocking “in” and “out” will no longer be necessary. Workers may rarely be in the office, and their working hours may bear little resemblance to the traditional nine-to-five schedule. What might the workplace look like in the year 2020?

#### wireless computers

#### video-mail

#### videophones

- Video-mail, complete with sound and an image of the sender, will pop up on a wireless computer screen that the worker can access anywhere.
- Videophones will provide “real time” images along with conversation.
- Meetings, conferences, and seminars that include participants in different locations worldwide will be conducted via satellite.
- Though office buildings will not disappear, the space inside them will be reconfigured to support a workforce that comes in primarily to attend meetings and retrieve data. The office of the future will be a place for focused work that requires true collaboration. It will also be a key site for socializing and cementing the relationships that keep an organization going.

SOURCE: Adapted from Susan Paynter, “Workplace 2020: What’s in Store for Working Mothers in the Brave New Business World of Tomorrow,” in *Working Woman*, May 1999

workers’ tools are telephones, fax machines, and personal computers. With the rapid introduction of mobile phones, laptops, e-mail, and the Internet, the traditional time and space requirements of office workers are no longer the rigid constraints of the past. In particular, the growth in computer applications and the Internet has enormous potential to help lower barriers to job opportunity for workers with disabilities.

A beginning trend in the increased use of flextime and flexiplace followed the lifting of traditional constraints. Only a fraction of employers currently avail themselves of such arrangements, but new technologies that permit this flexibility have been introduced relatively recently: access to the Internet, widespread use of e-mail, and the prevalence of cellular and digital phones all occurred in the latter half of the 1990s. As the popularity of these tools grew, their costs decreased. Prevalence has demystified their use, making them ordinary implements for conducting business.

Because the new technology is flexible, the workplace of the future will see a substantial increase in the number of workers who work from their homes or some location other than the office, though the overall proportion of workers who do so will remain small in the near future.

Assistive technologies are opening up the workplace to individuals with disabilities. Character readers and voice recognition devices, for example, help workers with visual impairments. (See box 6.6.) “Smart” prostheses employing microprocessors



help their wearers to perform workplace tasks. Communications and computers make possible accommodations such as home-based work, flexible schedules, and job sharing. Home-based customer-call-in centers are examples of businesses that, because of advances in technology, have been able to tap the abilities of workers with disabilities.

New flexibility in the workplace presents a number of opportunities and challenges. Telecommuting and flexiplace programs will reduce commuting time—creating more family time—allowing workers to live in areas far from their employers' offices. These new work options particularly benefit workers facing child-rearing and eldercare responsibilities and

workers with disabilities. But the flexibility also opens up the possibility of exploitation and abuse if employers require homework above and beyond normal working hours or establish modern home sweatshops. Workers physically isolated from their coworkers and supervisor may also encounter a kind of discrimination—in promotions or other workplace opportunities—based on lack of “face time” with senior officials.

#### CHANGING RELATIONSHIPS, CHANGING RISK, CHANGING REGULATION

The potential for employer abuse of flexible workplace arrangements raises the broader issue of whether present laws are adequate for new workplaces. The Department of Labor administers approximately 180 labor laws. Other agencies, such as the Equal Employment Opportunity Commission and the National Labor Relations Board, enforce other fundamental worker-protection laws. By and large, these laws were enacted when the most prevalent workplace model involved a stable employer–employee relationship, with the typical employee working full time, but new workplace technologies are changing this model.

Changing technology also has potential impact on other workplace issues, such as the safety and health of workers. Technology can cause ergonomic problems—and solve them.





Most people with significant disabilities are not employed, despite the fact that many have relevant labor market skills and the booming economy of the 1990s has left employers facing a severe labor shortage. Technology is bringing more people with disabilities into the workplace by removing at least some of the physical and communication barriers that have historically forced isolation and segregation.

To better meet the employment needs of its agencies and of people with disabilities, as well as to further its role as a model employer, the federal government has made significant investments in providing the employment supports necessary to hire and maintain employees with disabilities. For example, the Computer/Electronic Accommodations Program, or CAP, established by the U.S. Department of Defense in 1990, helps expand employment opportunity for persons with disabilities by providing assistive technology to employees and managers in the Department of Defense and other federal agencies. Assistive technologies are technical accommodations, including large-screen monitors, voice-recognition software, alternative keyboards, Braille displays and printers, and other tools, that make computer and telecommunications systems accessible to employees with disabilities.<sup>18</sup> CAP provides a number of other disability-related services. The program funds sign-language interpreters, readers, and personal assistants for employees with disabilities who need to attend longterm training; provides accurate and timely needs assessments; and hosts the CAP Technology Evaluation Center, or CAPTEC, where employees and their managers can explore alternative accommodations at workstations equipped with a wide variety of assistive technologies. People seeking solutions to accessibility problems can visit CAPTEC to see and compare the types of equipment available. Thus customers are assured that they purchase the product most effective at helping the employee carry out his or her job.

*(See box 6.7.)* The manufacture of computer chips may expose workers to new chemicals, whose hazards are not yet understood. And enforcing job safety and health laws may be difficult when offices are located in private homes.

New technologies might also affect worker rights in new ways. Genetic testing of current or prospective employees has raised concern about new discriminatory practices such as screening out persons who may incur high medical costs. In 1998, the American Management Association surveyed firms on the use of genetic testing and found that fewer than one percent were performing such tests.<sup>19</sup> However, the fact that such tests are being

performed at all raises questions regarding potential abuses—questions that need to be addressed early on.

Of more immediate concern is the issue of workplace privacy. Forty-five percent of major U.S. firms—according to a 1999 survey by the American Management Association—report that they record and review employees' communications and activities on the job, including telephone calls, e-mail, and computer files. This represents a 10 percent increase since 1997. Firms cited cost control, legal concerns, and performance reviews as reasons for these practices.<sup>20</sup> As technology provides more sophisticated methods of monitoring and surveillance, privacy issues may arise more often.

### Better, faster, more accessible information

Technology can also have a positive impact. Computer-based technology has sped up and broadened the access to information for workers and businesses. The Department of Labor has funded a Web site to help bring together job seekers and employers in a virtual labor market. (*See box 6.8.*) The site provides information electronically on job openings, job seekers, education and training opportunities, and career counseling.

Employers spent \$105 billion on online recruiting in 1998. Such spending is expected to increase more than tenfold by 2008. The power of online job hunting is exemplified at Cisco Systems, where two out of three new hires apply on line. The process shaves 68 days off Cisco's typical hiring cycle.<sup>21</sup> Workers, too, have benefited. One Silicon Valley worker lost her high-tech job of seven years just before Christmas. She told her incredulous husband, "The Internet is going to find me a job

B O X 6.7

### Ergonomics and the workplace

Technology is a powerful influence in the workplace: it both creates and solves problems.

Musculoskeletal disorders—"ergonomic" problems—arise when equipment and jobs are designed without sufficient regard for the physical capabilities of workers. Examples are familiar: back injuries caused by heavy lifting; shoulder, elbow, and wrist injuries due to excessive repetitive motion; and muscle strain when a job requires excessive force or working for long periods in awkward postures, such as bending from the waist or working with arms raised above the head. Even physical tasks that seem to require little force, such as keyboard data entry, carry a risk of injury to the wrists, such as carpal tunnel syndrome. In the past, many workers simply lost their jobs when these injuries occurred—and many still do.

While technology may cause some of these problems, it is also a source of solutions. Industries have developed new equipment and redesigned older tools to reduce or eliminate the sources of ergonomic problems. Workers in the meat-packing industry, for example, can now use power-assisted devices, reducing the effort required to do their jobs. Their hand tools also have been improved to reduce vibration and require less force. Improved lift devices reduce or eliminate their need to lift and carry heavy loads.

However, technology is not simply tools and hardware; management is also an important dimension. Good management can identify existing and potential hazards and seek out preventive measures that will avoid injuries—and the costs and pain they bring. Workplace ergonomic programs are one example of management technology in action. In these programs, workers and managers together identify hazards, develop and test solutions, train workers, and evaluate and report on their efforts. In workplaces with unions, a joint labor-management committee can handle many of these functions. Good programs also feature appropriate medical management to ensure that small, temporary problems do not become large, permanent ones. And these programs may operate within existing management and safety programs to improve their efficiency and cost-effectiveness.

With the introduction of America's Job Bank, the Department of Labor laid the foundation for a virtual labor market—America's Career Kit. America's Job Bank is a “demand side” Web site where employers have already listed more than one million job openings which can be viewed daily by thousands of job seekers. Registered employers can now upload new job openings to the site daily, permitting them to keep their requirements up-to-date.

The second building block of the virtual labor market is America's Talent Bank, a Web site where job seekers can post their resumes. This “supply side” site, an important companion to the Job Bank, currently hosts 400,000 resumes.

The third building block—America's Career InfoNet—provides information on labor markets and career paths. This Web site provides information on which occupations are likely to increase in demand in the future and what skills they will require. Links to information on local labor markets permit the user to tailor a job search to opportunities in a particular region or locale.

America's Learning Exchange provides information on training opportunities available to those seeking to upgrade their skills or to obtain new ones. Once a user has explored the Career InfoNet and decided upon an occupation, he or she can use the Learning Exchange to identify training needs and nearby training sources.

Finally, the Department is developing O\*NET, the Occupational Information Network, to provide a common language about skills linking these America's Career Kit sites.

An employer listing a job on America's Job Bank is seeking a worker with particular skills. Similarly, a worker posting a resume on America's Talent Bank is trying to describe to prospective employers the skills that he or she has to offer. America's Career InfoNet and America's Learning Exchange focus on the skills needed for various occupations and on the training needed to acquire those skills. America's Career Kit is a set of tools that define the relationship between and among occupations, careers, and training, using the common denominator of skills. These tools will help match job seekers with jobs and help workers determine what skills they need and where to go for training.

while I'm sleeping,” and posted her resume on 30 Internet job boards. Within the month, she had received 60 inquiries. She then accepted a senior project manager position, a post better than the one she had lost.

Employers will also be able to train their workers more efficiently and effectively with new learning technologies. Technology-based training can accommodate differences in employee skill

levels, in learning style and pace, and in family demands. The Federal Technology Training Initiative (FTTI) is a collaborative effort bringing together federal trainers, educators, and information technology experts to transform the way federal employees will learn in the twenty-first century. Partnerships have already been forged among key federal agencies, state and local governments, private industry, and universities. These partnerships are developing innovative business models that can spur investment in high-quality, technology-based instructional materials and methods.

CROSSING THE BORDER:  
GLOBALIZATION OF  
THE AMERICAN ECONOMY

The 1990s saw a combination of rapid technological change and widespread globalization, in part because the two processes are intertwined. The technologies underlying the Internet and telecommunications have increased the flow of information between countries, speeding the globalization process. At the same time, the spread of free markets has promoted greater competition worldwide, creating strong incentives for domestic producers to adopt new technologies.

Innovation and the ability of industries and companies to harness and apply technological innovation effectively will provide the edge in this new competitive framework. Clearly, competitive players in the global economy will need to staff their workplaces with technologically proficient workers.

Labor market effects of globalization

The 1990s will be remembered for the spread of free markets. The fall of the Iron Curtain in 1989 has resulted in the institution of free market economic regimes, with varying degrees of success, in virtually all of the countries of the former Soviet Union, as well as Eastern European countries and even China. Concurrently, many less-developed countries in Asia and Latin America, at the urging of the international financial community, have reduced their barriers to free capital markets. The result has been the rapid expansion of trade and the movement of capital and information between countries.

President Clinton has made the expansion of international trade one of the three pillars of his economic policy: opening markets abroad to U.S.

products improves U.S. economic performance. In the ten years ending in 1997, U.S. exports grew over 140 percent and accounted for one-third of total economic growth. But just as importantly, the President has been a strong and consistent advocate of *fair* trade, that is, a trading system that benefits all members of society. The economic health and security of American workers is increasingly tied to the health of the global economy. Ensuring quality jobs for American workers requires building a stable, secure, and prosperous international economic system in which all workers can achieve higher wages and greater economic security.

Improving labor conditions and securing workers' rights around the world are keys to creating new markets for exports, broadbased prosperity, sustainable economic growth, and stronger democracies. Building sound safety nets and implementing core labor standards help ensure

Every single day, a half million airline passengers, 1.4 billion e-mail messages, and \$1.5 trillion cross national borders.

President Bill Clinton  
June 12, 1999

T A B L E 6 . 1

U.S. trade flows: imports and exports of goods and services (in U.S. dollars)

	Imports		Exports	
	Goods*	Services**	Goods*	Services**
Canada	\$175 billion	\$14 billion	\$156 billion	\$21 billion
European Union	\$176 billion	\$54 billion	\$149 billion	\$75 billion
Africa	\$ 16 billion	\$ 3 billion	\$ 11 billion	\$ 4 billion
South and Central America	\$ 50 billion	\$22 billion	\$ 63 billion	\$34 billion
Mexico	\$ 95 billion	\$13 billion	\$ 79 billion	\$ 9 billion
Pacific Rim	\$329 billion	\$36 billion	\$167 billion	\$70 billion
* 1998 data				
** 1997 data				
SOURCE: U.S. Bureau of Census				

minimum working conditions. Indeed, expanding trade and securing basic worker rights can be mutually reinforcing goals.

Many countries in the developing world lack the resources or know-how to implement core labor standards. An even greater number lack the ability to create mechanisms that could improve working conditions, help dislocated workers find new jobs and skills, and help women who have been locked out of the economic mainstream. These countries are increasingly turning to international organizations and to the developed nations of the world for help in raising work standards by increasing the institutional capacities of their labor ministries and the industrial relations institutions that help resolve disputes through democratic means. As economic globalization and rapid technological change dramatically alter the world of work, the International Labour Organisation (ILO) has the preeminent international role to meet this challenge. The ILO is focusing its efforts on promoting fundamental principles and rights at work, improving living and working conditions, and creating employment.

#### Core labor standards

In June 1998, the International Labour Conference adopted the ILO *Declaration on Fundamental Principles and Rights at Work* and its *Follow-up*. The *Declaration* promotes adherence to five fundamental principles which have come to be known collectively as core labor standards—the right to freedom of association, the right to organize and bargain collectively, the elimination of forced or



compulsory labor, the effective abolition of child labor, and the elimination of discrimination in employment. The ILO will hold all member states accountable for these standards.

Unfortunately, there are many places around the world where the basic worker protections are not guaranteed. In some countries facing civil conflicts, such as Colombia, trade union leaders have been the victims of violence. In China and Sudan, there are widespread violations of basic trade union rights, and labor activists face the threat of arrest. In Burma, there is a total absence of any rights in the workplace, and forced labor is imposed on the civilian population by military authorities. In Afghanistan, women and girls may not go to school or work outside the home. And, worldwide, there are an estimated 250 million children between the ages of 5 and 14 who work—approximately 120 million full-time—and tens of millions of them work under deplorable conditions.<sup>22</sup>



In June 1999, the ILO unanimously adopted a new convention on the worst forms of child labor. The convention establishes a universally recognized international standard for protection of children against forced or indentured labor, including forced or compulsory recruitment of children for use in armed conflicts, child prostitution or pornography, drug trafficking, and other work likely to harm the health, safety, or morals of children. This new convention will augment efforts by the ILO's International Program on the Elimination of Child Labor (IPEC). IPEC develops region-, country-, and industry-specific projects targeting situations where children work in exploitative or dangerous conditions. The United States became the world's largest donor to IPEC in 1999 when President Clinton sought and won a tenfold increase in U.S. funding for international child labor activities, including some \$30 million a year for IPEC.

U.S. labor market strategies must be developed in the context of increasing global market integration, since globalization will continue to have significant economic and social consequences for U.S. workers. Questions about how we improve the lives of working people, how we make sure that prosperity is broadly shared, and how we ensure that workers have the tools needed to manage change must be answered.

International trade benefits workers, consumers, and producers in the countries involved—through lower consumer prices, more efficient production of goods and services, and higher economic growth. Although the gains of trade are widely distributed, the losses are concen-

trated in import-competing sectors that, without protection, are no longer competitive. Those industries affected tend to be concentrated in specific geographic areas. Some evidence shows that imports, together with mechanization, have contributed to job loss in manufacturing industries such as textiles/apparel and steel.<sup>23</sup> However, these job losses tend to be offset by job and income growth in other industries.

International trade seems to contribute to job growth in sectors where the United States exports heavily. In many durable goods industries—such as industrial machinery, electronics products, and transportation equipment—exports account for large parts of total production and employment. Overall employment in these industries has generally risen since 1993. International trade probably has little effect on overall unemployment rates in the United States since the U.S. labor market is

Globalization consists of trade, immigration, capital flows, and information flows.

Professor Richard Freeman  
February 25, 1999

TABLE 6.2 | Five industries in which exports account for a high percentage of employment, 1998

Industry	Percent of employment tied to exports
Engines and turbines	47
Aerospace	44
Electronic components and accessories	44
Metal mining	42
Water transportation	41

SOURCE: Unpublished data from the Bureau of Labor Statistics



likely flexible enough to adjust to these kinds of sector shifts and to generate low unemployment rates over the long term.

While U.S. consumers benefit from the lower product prices generated by international trade, at least some U.S. workers, companies, and communities are hurt, particularly those workers who permanently lose their jobs, and those companies that go out of business because of imports. To be sure, about one in four displaced workers are in manufacturing,<sup>24</sup> but international trade accounts for only a fraction of that.

Some Americans fear that international trade will cause a “race to the bottom,” in which competition for jobs with the lowest-wage countries will lead to wage reductions around the world. This is a legitimate concern but unlikely to be a real threat. In fact, the contrary appears to be true. Since the trade agreements of the 1990s, U.S. wage levels ended a twenty-year period of stagnation. Americans are once again experiencing real wage gains. Countries with very low wages generally have low-skilled workforces and very low levels of productivity. Employers who require skilled workforces are, therefore, discouraged from locating there. Furthermore, countries such as South Korea, Taiwan, and others in East Asia that have succeeded in attracting employers from the United States and Europe generally experience rapidly rising wages, thus narrowing the wage gap between their workers and U.S. workers. Finally, the international labor standards described above are an important component of a fair-trade strategy, ensuring that workers around the globe share in the gains of international trade.

#### THE FUTURE

Rapid changes in technology are expected to continue—as is the resulting widespread impact on industries, businesses, and workers. These technological changes will further alter how products and services are made and delivered and will continue to affect the workplaces in which they are conceived, sold, and produced. The workforce of the future will need to adapt to the rapid pace of technological change by continuing to upgrade their skills. The importance of lifelong learning cannot be overestimated.

Some workers may lose their jobs as a result of changes in trade patterns. The proper public policy response to such job loss is not protectionism, but rather assisting individual workers to adjust to labor market changes caused by increased trade and globalization. The Trade Adjustment Assistance Program and the North American Free Trade Agreement Transitional Adjustment Assistance Program, both administered by the Department of Labor, offer a comprehensive array of income support, retraining, and reemployment services to workers who lose their jobs because of international trade. Additional assistance to dislocated workers is available through the Job Training Partnership Act, which is being replaced by the Workforce Investment Act. Job search allowances may also be provided to workers seeking suitable employment outside their normal commuting area and relocation allowances may help defray moving expenses should they find employment in another part of the country.

More broadly, policies to prevent job loss from international trade or to facilitate the transition of affected workers to new jobs continue to be important. Ensuring fair and open trade among countries must remain a part of this policy package. Policies that encourage more private sector training of workers before they lose their jobs might also be an important part of a job-loss-prevention strategy.

I have long believed that a strong economy in a foreign land is not a threat to our jobs; it's a new market for America's products; an engine of human dignity and environmental preservation; a partner for peace and freedom and security. But I strongly believe that the only way to do that is to have trade agreements that lift everybody up, not pull everybody down. They shouldn't undermine labor rights or environmental standards. They should enhance labor standards and environmental protection all across the world.

**President Bill Clinton**  
*June 12, 1999*